

# Sensor Based Alert System at Unmanned Level Crossing

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## Abstract

As per the Indian Railways Department, there are 30,348 level crossings across the country out of which around 11,563 are unmanned. Nearly 40% of the train mishaps / accidents are due to unmanned level crossings.

So, in our proposed system, all unmanned level crossings are to be fitted with microphone sensors, which can easily detect / identify the movement of the trains on the railway track, which in turn, will signal the level crossing with Red warning light, followed by a siren when the train is at a distance of 1 kilometer radius. These sensors are solar operated supplemented by batteries too. Also, the sensors have theft protection system, any damage or removal of the sensor will automatically send sms to the concerned railway authorities before it is shifted / destroyed. So that it can be replaced at the earliest. In addition the sensors can be put under surveillance camera, if that region is prone for theft. The proposed system may be implemented on a trial basis, at the initial stage. Also the entire setup (sensor, camera, red signal and the siren) can be made functional using solar panel, as a move towards solar energy.

**Hence, the proposed system can**

Enable zero accident at level crossings.

Vandal proof warning system at level crossings.

Encourages the usage of solar energy.

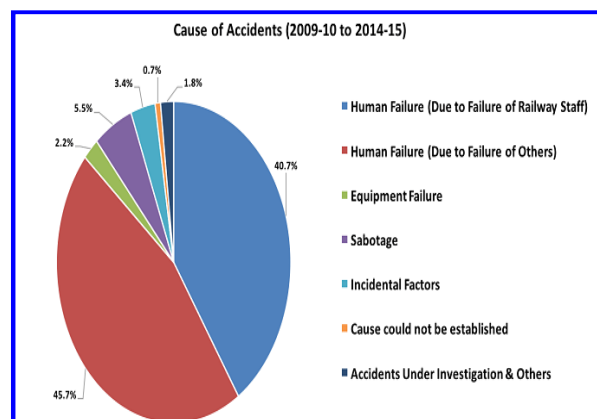
Cheaper than building over bridges/ sub ways.

**Keywords:** Sensors , Solar panel , unmaned level crossing, signal

## 1. INTRODUCTION

The India national railway is the one of the the forth longest in the world, it is owned and operated by the state-owned Indian railways and its includes an operating route length of more than 65,000 km. This network operates 12000 passenger trains and 7000 freight trains (Fact sheet). The national railways operator plans to add 4000km of new lines and 3,338km of exclusive freight network by 2017. There are a total of 30,348 level crossing across the country of which 18,785 are manned and 11,563 are unmanned. Most of the case the accident was caused by the un named level crossing. Our Indian railway found there are 87.75% accident are happened by the human failure. Train accidents occurs the terms in loss of human life, injury, damage to railway property. To prevent this problem here we introduce a Microphone sensor which is used to capture the audio by converting sound waves into an electrical signal. it placed under the railway track it can identify the movement of the trains on the railway track, and its produce signal the level crossing with

Red warning light, followed by a siren when the train is at a distance of 1 kilometer radius. So its helps people to alert themselves while they crossing the track. It also help to prevent the accident.



**Fig. 1.1:** Illustrates the percentage of railway accidents in India due to various reasons during 2009 to 2015

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## 2. LITERATURE SURVEY

1. Abhijith S , M. Kottalil, Abhilash L J, Ajmal M M, Ajith Babu (Fact sheet). In this paper was implemented to prevent the railway accident . here the problem was prevented by a skilled worker those who are worked in the railway level crossing areas.in this paper they are implemented AT mege 16 A microcontroller and IR sensor to control such operation like opening and closing gate
2. N. Thamilarsi , P. Balasubramanian, This paper was implemented by these author here thy introduced the two main things which is help to prevent the accident in the unmanned level crossing .the two main things are first one reduction time of the close gate and another one is to provide the safety to user those who travelling on the unmanned level crossing.
3. Hnin Ngwe Yee Pwint, Hla Myo Tun and Zaw Myo Tun. In this paper is described about the automatic railway gate system by using the PIC 16F877A microcontroller which is used to prevent the human lives here they are used the IR sensor as a input components which is help to given the alert signal to the user and the output components are light indicator , LCD display and buzzer.
4. Krishna, Shashi Yadav and Nidhi .these author was implemented this paper to control the railway track by using the anti – collision technique. 8952 microcontroller is a technology is used to entire system to avoid the railway accidents.
5. Sandya Goutam *et al.* is presented a paper about the major cause of the accident that is on the same track is referred as collision. This paper implemented to reduce the track collision problem by using the anti collision system .In this system is used to identify such collision and it report such problem in the main control room which is near by station .it is mainly used the microcontroller technology.
6. R. Gopinathan *et al.* proposed an “PLC based railway level crossing gate control”, in this paper to implemented to reduce frequent accidents which is happening in the unmanned level crossing it is mainly build for operate a automatic railway gate operation. It deals with two things, first one is reduction of the time and another one to provide safety. It is highly a PLC based managements.
7. Elisha C. Mabunda1 *et al.* proposed a “Microcontroller based model design of a train collision avoidance system”. This design comprises an apparatus for detecting the presence of an approaching locomotive within a specified limited area. The system is integrated with the braking system of the train using embedded technology; hence rail traffic accident can be minimized.
8. M. D. Anil *et al.* proposed an “Advanced railway accidents prevention system using sensor network”, In this paper was use the IR sensor and electrics breaking system which is used to control the train speed. It is mainly used to avoid the accidents in railway track.
9. Azrulnor Bin, proposed an “Development of a Traffic Light Control System Using PLC”. Hardware and Software is a two parts used in this paper .the hardware part is traffic light and the software part with Omran PLC, it is controlled the rail accidents.
10. G. Anjali Bissa and S. Jayasudha proposed in "Train Collision Avoidance System Using Vibration Sensors and Zigbee Technology" in this paper they have used two main module first one id Vibration sensor and another one is Gap detector, Vibration sensor senses the vibration of the train in the track and second one gap detector is used to detect the gap in the track both of this sent alert information in the respective operative room. Both of this fitted in the railway engines.
11. N.Ramasamy, "Automatic Obstacle Detection in Railway Network Using Embedded System" in this paper proposed to prevent the fire accident in railways.this sensor can detect the smoke and snt information to the respective mobile number and emergency service.

## 3. EXISTING SYSTEM

In the existing system our Indian railway using a new technology which is called Rail microwave radar. It is used to find the train position in every station (Skolnik, 2001) and WSN is one of the technology which is used to operate the railway gate when it get the obstacle is founded in the track it would take too much of time to clear traffic (Ajith Theja *et al.* 2010). Presently railway-crossing gate area units are operated manually in 50% of the Indian railways. Most of the level crossing are in unnamed .At this time at level crossings, a gatekeeper operates the railway gate usually once receiving the data regarding the train's arrival. Once a train starts to go away a station, master of the actual station delivers the data to the another station which is used to the closed gate immediately. But some problems could be found in this named and unnamed level crossing because of the lake of mistakes of human. In our proposed system we could invent the new method to prevent this problem

In our Indian railway is a one of the longest railway in the world there are two types of level crossing systems are followed here, they are

- Manned level crossing
- Unmanned level crossing

Manned level crossing is operated by the gate Keeper. The gate keeper transfers the information to the next station control room when the train arrive that station. Sometimes it also make the accident in the particular interval because delay of the open and close of the gate.

Unmanned level crossing is causes the major problem in the Indian railways.

These problems are prevent by using the microphone sensor it detect the train approaching. The two sensors is place on either side of the gate. This work utilizes the two sensors placed on either side of the gate. Fig. 3.1 depids the representation.



Fig. 3.1: Symbolic representation of unmanned level crossing

## RAILWAY CROSSING

Railway Accidents is classified on the premise of cause and result (Sandhya Gautam *et al.* 2010; Acy M. Kottalil *et al.* 2014).

**Head on collision:** The train colliding on an equivalent track from opposite ends referred to as head on collision.

**Rear end collision:** the opposite kind is once a train collides into the opposite that's before of it, referred to as a rear end collision.

## 4. PROPOSED SYSTEM

In proposing system we have implemented the powerful technology by using the micro phone sensor. The sensor is a device that detect and respond some type

of input from the physical environment (Elisha C. Mabunda and Cleophas D. K. Mutepe, 2013). The specific input could be light, heat, motion, moisture, pressure etc. The output is generally delivered like a signal. Here we implemented the microphone sensor it can detect the movement of the train from the track and its produced the red warning light with the loud siren which is helping people to prevent them from accident. The microphone sensor was placed either side of the railway track when the train come to reach that particular station before 1km the sensor could find the vibration of the train at its ready to give the alert signal which is in red color and also delivered a siren. When the train crossed that particular level crossing the sensor automatically off its mode. The microphone sensor its getting the power from the solar panel and it is stored in batteries. Fig. 4.1 depicts the accident avoidance picture.

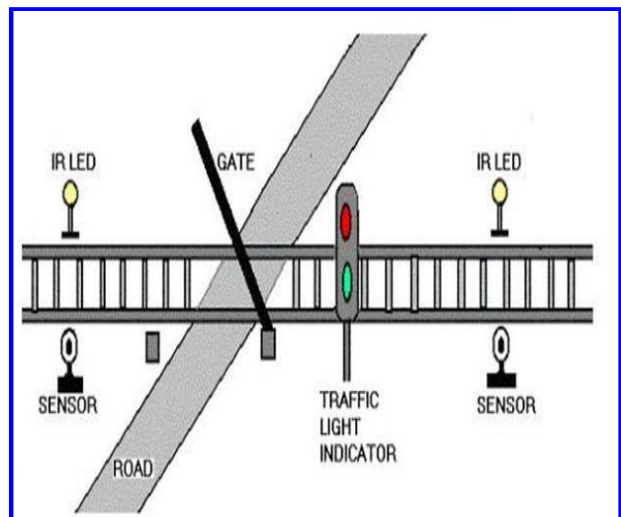


Fig. 4.1: The above pictute represent the avoiding the railway accident.

## ADVANTAGES OF PROPOSED SYSTEM

- Avoid accident
- Time Saving
- Accuracy
- Automatically detect the train
- Low operating cost
- Real time information processing
- Less man power

## HARD WARE COMPONENTS IN PROPOSED SYSTEM

Solar powered with internal and external pane sound sensor includes a highly sensitive microphone for audio input. Use this module to detect or record sound by simply reading the analog output from the microphone.



**Fig. 4.2: Solar panel**



**Fig. 4.3 Micro phone sensor Sound Sensor (Microphone) Module**



**Fig. 4.2: Red signal LED light**

### MICROPHONE SOUND SENSOR

A microphone sensor that detects sound signals and converts them into an electrical signal (Elisha C. Mabunda and Cleophas D. K. Mutepfe, 2013). Most of the microphones to produce the electrical signal from mechanical vibration. It is used to find the vibration from the surrounding and then it convert it into the audible signal.

The two most commonly used microphones are the dynamic and the variable condenser microphones.

#### Dynamic microphone

Dynamic microphones are operated based on electromagnetic induction. It produce sound only in the reverse direction.

#### Condenser microphone

Condenser microphones are operated based on the electrostatic field. It get power from a battery or an external resource. It can produced the stronger audio signal than the dynamic microphone.

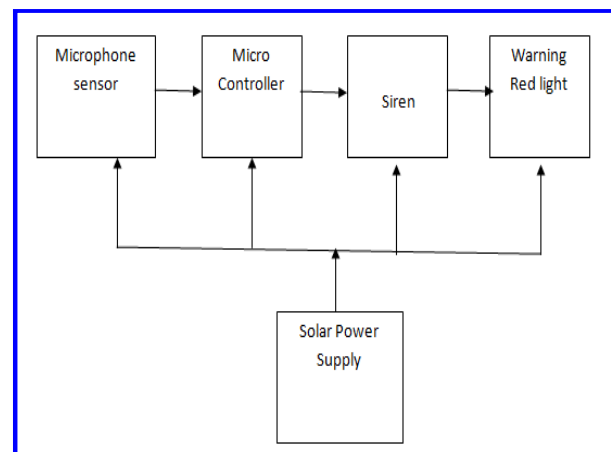
## 5. METHODOLOGY

There are 2 sensors are placed both side of the railway track such as s1 and s2. s1 indicates sensor 1 and s2 indicate sensor 2.

These sensors (condensor microphone) are placed 1 km from the level crossing When the train comes to reach the station that particular direction sensor senses the vibration of the track and sensor could be worked and produce the signal with siren that particular direction.

Here the microcontroller is a main concept is used to control the rail way accidents.

### BLOCK DIAGRAM DISCRIPTION



The arrival of the train detected by the sensing element placed both side of the gate at about 1km from the level crossing. Once the arrival is detected, the detected signal is distributed to the microcontroller.

The micro controller control the processes and it produce the siten with signal.



## 6. CONCLUSION

In our new implementation is used to avoid the accidents at places where there is a no person to managing the level crossing.

The alert and warning siren in microphone will alert the passengers well in advance reducing the accidents and property. And it also take low power and consumption system. This paper fully automated for improved Indian railways. With this proposed system a way can be made for the more effective modernization of the Indian Railways. To make the proposed system more effective a motion sensor camera find fraud detection in railway track. By using these system we can avoid accidents and we can get the nil accident from it.

## 7. SCOPE FOR FUTURE

The entire network can be implemented in the wireless technology. We can implement this system to modify our Indian railway as a modurization. If this wireless technology is fully implemented in our railway we can monitor the railwaysystem through out automatically.

If we use this technology in future we can get nil accident result in the unmanned level crossing and also we can also make our Railway as amodurization in the world.

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